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MEMORANDUM

SUBJECT: Source Determinations for Combined Heat and Power Facilities under the Clean Air Act New Source Review and Title V Programs

FROM: John S. Seitz, Director
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TO: See Addresses

This memorandum provides guidance clarifying our new source review (NSR) and Title V policies regarding source definition for combined heat and power (CHP) facilities.

I. Introduction

The relevant programs to which this guidance applies are the title I (Part C) prevention of significant deterioration (PSD), title I (Part D) nonattainment new source review (nonattainment NSR), and title V operating permit programs. (The nonattainment NSR and PSD programs are hereafter referred to collectively as the new source review or NSR program.) Regulations implementing these programs are found, respectively in 40 CFR Parts 51 and 52, and 70 and 71. This guidance explains the Environmental Protection Agency's (EPA's) interpretation of what is minimally required under these regulations; it is not intended to supersede or replace more stringent approaches taken by any particular air pollution control agency or permitting authority.

The interpretations and policies set forth in this document are intended solely as guidance, do not represent final Agency action, and cannot be relied upon to create rights enforceable by any party. Furthermore, this guidance applies prospectively only for major stationary source determinations under the NSR program and it does not affect any preexisting major source determination made by a permitting authority, in accordance with applicable State and Federal requirements.

II. Background

The combined generation of heat and power, also known as cogeneration, has been an energy supply option for nearly 100 years and is used in many sectors of the economy. Early applications were found in steel mills, pulp and paper mills, refineries and other energy intensive facilities where reliability of energy supply was of paramount concern. However, CHP projects declined in the post-

war era when low-cost, reliable, centrally dispatched power from utilities became more widely available. Although low in cost and high in reliability, central power plants are not as efficient as CHP.

In current energy and environmental conditions it has become increasingly important to improve the efficiency at which we convert fuel into useful energy. Furthermore, due to energy demand, energy prices, need for reliability, and electric grid constraints, it is becoming more common for industrial complexes, universities, municipalities, and other power quality markets to install self-generation or to "out source" their heating, cooling, and mechanical and electric power needs to separately owned, but collocated, companies that provide energy services on a contract-for-service basis to their customers. An existing or new thermal customer facility, such as a chemical manufacturing plant, becomes the customer, or "host," of the CHP facility. The existing facility, which formerly managed its own steam production operations to support its main line of business, can then divest itself of the day-to-day business of heat (and sometimes power) production and obtain long-term access to favorably priced steam and electricity.

It is our intent to encourage these CHP systems in order to achieve our goal of minimizing environmental impact through improved efficiencies, reduced fuel demand, and reduced emissions. Because CHP systems must be collocated with thermal customers (existing or new sources), representatives of the CHP industry have asked for clarification of EPA's new source review and Title V policies regarding source definition.

III. Benefits of CHP

In light of ever increasing demand for energy, electric power industry restructuring and cross-program pollution prevention initiatives, EPA is committed to improving the efficiency at which we convert fuels into useful energy. Properly designed and implemented CHP is a key element to achieving the nation's energy goals, because CHPs are capable of independently providing power to the grid or customers other than the host facility and therefore can help alleviate power shortfalls. Recognizing this, the Report of the National Energy Policy Development Group recommends "that the President direct the EPA Administrator to promote CHP through flexibility in environmental permitting"[1] and also recommends "that the President direct the Administrator of the [EPA] to issue guidance to encourage the development of well-designed [CHP] units that are both highly efficient and have low emissions. The goal of this guidance would be to shorten the time needed to obtain each permit, provide certainty to industry by ensuring consistent implementation across the country, and encourage the use of these

[1] *Reliable, Affordable, and Environmentally Sound Energy for America's Future*, Report of the National Energy Policy Development Group, May 2001, p. 4-9.

cleaner, more efficient technologies."[2]

Because CHP facilities produce both steam (or other thermal output) and power sequentially from the same fuel combustion source, CHP is a significantly more efficient means of converting fuel to useful energy as compared to traditional power generation. Traditionally, electricity is produced at centrally located power plants and steam/heat is produced at the point of use (at industrial, commercial, institutional locations using boilers). This requires burning fuel at two separate locations and is known as separate heat and power (SHP). SHP is less efficient than CHP because central power plants have a typical fuel conversion efficiency of 30-50% and the transmission of electricity to the user causes losses estimated at an average of 7%. CHP involves locating the power generation unit or units at the facility where the steam/heat is used and burning fuel only at that one facility to produce electricity and recovering the waste heat from the process to produce steam/heat (thereby eliminating the need for a separate boiler). In addition, by locating the CHP at the point of use the electricity transmission losses are reduced or eliminated. For example, a new simple cycle or combined cycle electric-only power plant might be 30-50% energy efficient -- i.e. it wastes 50-70% of the fuel that it burns in the form of heat. On the other hand, that plant, relocated to an industrial steam host and configured into CHP, recovers most of the waste heat to produce steam in addition to the electricity and might be 70-80% energy efficient - i.e. it produces more output (electricity plus steam) while only wasting 20-30% of its fuel input.

Finally, CHP facilities also provide the opportunity to reduce load congestion on power transmission lines in areas where demand for electricity threatens to outstrip transmission line capacity. CHP may also be used to convert facility waste streams into useful energy and to support the redevelopment of brownfields. The Report of the National Energy Policy Development Group recognizes this as well, and recommends "that the President direct the EPA Administrator to promote the use of well-designed CHP and other clean power generation at brownfield sites, consistent with the local communities' interests..."[3]

All of these benefits can be achieved in small or large scale projects such as a small/medium CHP providing the heat and power for a small/medium industrial facility, or a large CHP at a refinery providing the steam and power for the refinery and providing surplus power to the grid.

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[2] *Reliable, Affordable, and Environmentally Sound Energy for America's Future*, Report of the National Energy Policy Development Group, May 2001, p. 6-18.

[3] *Reliable, Affordable, and Environmentally Sound Energy for America's Future*, Report of the National Energy Policy Development Group, May 2001, p. 4-9.

IV. Discussion on Source Definition as it Pertains to CHP facilities

Why does current guidance for defining stationary source not fully address CHP facilities?

We finalized our current regulatory definition of "stationary source" for purposes of implementing the PSD program in 1980. The definition was developed pursuant to the Court's decision in *Alabama Power*[4], and EPA's interpretation of that decision, regarding the appropriate boundaries on the definition of "source" for PSD purposes. Since then, the same (or essentially the same) definition has been codified for use in the nonattainment NSR and the title V operating permit programs.

Under our current NSR and title V regulations and guidance, a "stationary source" is any building, structure, facility, or installation that emits or has the potential to emit any air pollutant subject to regulation under the CAA. "Building, structure, facility, or installation" means all the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are "under the control of the same person (or persons under common control)."[5] An emissions unit is any part of a stationary source that emits or has the potential to emit any pollutant subject to regulation under the CAA.

The term "same industrial grouping" refers to the "major groups" identified by two-digit codes in the Standard Industrial Classification (SIC) Manual, which is published by the Office of Management and Budget. The preamble to the August 7, 1980 PSD regulations explains the Agency's policy about how to make source determinations when facilities at a site are not in the same two-digit SIC code. Essentially, the 1980 PSD preamble provides that activities in different two-digit SIC codes may nevertheless still be aggregated together if one activity is a "support facility" for a primary activity at that plant site. "Thus, one source classification encompasses both primary and support facilities, even when the latter includes units with a different two-digit SIC code."[6]

When an industrial facility owns equipment which burns fuel and generates air pollution, the fuel-burning equipment generally would be considered part of the same "stationary source" (or "source") as the other pollutant-emitting activities at that site that it supported with its energy output.

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[4]Alabama Power Co. v. Costle, 636 F.2d 323 (D. C. Cir. 1979).

[5]40 CFR 51.165(a)(1)(ii), 40 CFR 52.21(b)(6), and 40 CFR 70.2.

[6]*Requirements for Preparation, Adoption and Submittal of Implementation Plans; Approval and Promulgation of Implementation Plans*, 45 Fed. Reg. 52695, August 7, 1980.

Where ownership of the energy-producing equipment is transferred to another company that is in business specifically to provide such services (and in some cases also to sell electricity to the local power grid), there is a need to clarify under what circumstances the separately owned combined heat and power facility could be considered either a separate source from, or part of the same "source" as, the activities it supports for permitting purposes under the CAA.

V. Guidance for separately-owned CHP facilities

This guidance addresses instances in which a CHP project developer, a separately owned and operated entity from the host facility's owner/operator, purchases the existing steam (and sometimes electricity)-producing equipment from the host facility (generally boilers and turbines) and then retires it and replaces it with CHP technology, or upgrades it to incorporate CHP technology. The new, separately owned and operated CHP facility then contracts with the host facility to provide that facility's steam and some or all of its electricity. Once the CHP facility can access the local utility grid, it might sell excess electricity to the grid. In addition, the same CHP facility may enter into similar contracts with other nearby, but not necessarily contiguously located, customers of steam and/or electricity, either at the inception of the CHP project or over time. When the CHP provides steam/thermal energy to more than one customer, the CHP system is known as a district energy (DE) system.

1. Objective

The guidance clarifies EPA's interpretation of how the regulations apply in determining the boundaries of the major stationary source which must apply for a permit when a CHP facility is constructed, owned and operated by a party other than the host or customers. Our purpose in providing this guidance is to encourage equitable, swift, and consistent source determinations for CHP projects. In order to maximize the potential for achieving the environmental benefits associated with CHP development, we believe it would be helpful to clarify how source determinations should be made under the NSR and title V permitting regulations. Our intent is that, with a consistent understanding of how they may choose to make source determinations for CHP projects, both permitting officials and potential project developers can aid in streamlining the process for developing and permitting such energy projects across the country.

We believe that providing an incentive for the replacement of old boilers with CHPs will advance the statutory objectives of the NSR program. In nonattainment areas, those objectives include reasonable further progress towards timely attainment of the national ambient air quality standard (NAAQS). See 42 U.S.C. § 7502(c)(2). In attainment areas, the statutory objectives of the PSD program include insuring that economic growth occurs in a manner consistent with the preservation of

existing clean air resources. See 42 U.S.C. § 7470(3). We believe that net environmental benefits will result from CHP emissions replacing old boiler emissions even if emissions from CHP facilities that net out of major NSR are not subject to BACT or LAER controls. As discussed previously, CHP facility emissions typically are lower than those of the boilers that CHP facilities would replace to net out of major NSR, and CHP efficiency is greater. Moreover, many old boilers are grandfathered sources not subject to major NSR, and eliminating or reducing their emissions is expected to improve air quality. In addition, we recommend that any CHP facility that nets out of major NSR meet an emission limit that is at least as stringent for each pollutant as the emission rate of the boilers that it is replacing. This criterion is designed to prevent "backsliding" by sources. By providing an incentive for the replacement of old boilers with CHP facilities, this guidance will result in emissions reductions of pollutants including NOx, SO_2 and particulate matter (PM_{10}) and thereby will advance the objectives of the NSR program. Nevertheless this guidance should not, of course, be construed as discouraging any permitting authority from requiring state of the art controls on new or modified CHPs, even if they net out of NSR, when the permitting authority judges that controls are needed.

2. Applicability

In order to ensure the energy efficiency and environmental results upon which this guidance is premised, we recommend that permitting authorities consider whether a CHP facility meets all the performance criteria listed below in order to be considered a separate source from its host or customers under this guidance. We believe that these criteria promote increased efficiency and maximum emission reductions by excluding projects with efficiencies typical of "electric-only" projects and by promoting the use of cleaner fuels and advanced combustion controls. In addition to the performance criteria listed below, it is important for the permitting authority to insure that the installation of the CHP facility would not result in any violation of either a NAAQS or any PSD increment.

We recommend that permitting authorities apply these criteria because we believe they are achievable, cost effective and environmentally sound.

1. Ownership: The CHP should be under separate ownership from the host facility. Because we have generally considered ownership to be an indication of control, it is more likely that a separately owned CHP facility would be considered a separate source.

2. Efficiency: This guidance is intended to promote CHP projects that achieve fuel conversion efficiencies higher than state-of-the-art separate heat and power in all size ranges (that is, at present, higher than 50% efficient electric and 80% efficient steam generation). To that extent, for all CHP projects subject to this

guidance, the output of the CHP facility should consist of at least 20% of either heat or power (i.e. the ratio of heat output to power output, or vice-versa, should be no greater than 80/20). The CHP facility should also achieve the following performance:

$((2P + 1.25H)/F) > 1.0$,

Where P is electric (or mechanical drive) net output, H is net thermal output, and F is fuel input. Electric output is to be measured at the bus bar and thermal output is to be measured at the steam header. These performance criteria are explained more fully in Appendix I below.

3. If the CHP facility is netting out of major NSR, then for each pollutant, the CHP's potential or allowable emission rate must be lower than the actual emission rate of any boilers for which it obtains netting credits. In no event may the CHP's emission limit be less stringent than any other applicable requirement. This criterion is included in order to encourage continual improvement in energy efficiency and environmental results. (See section V.3. below for additional discussion of netting.)

In addition, it should be noted that a CHP which is an integral part of an industrial host's process – i.e. which could not, in theory, stand alone from the industrial process or which is connected by more than steam lines to the industrial process – would need to be evaluated on a case-by-case basis to determine its eligibility to be considered a separate source under this guidance. An example of this would be a CHP which is also serving as a control device to fulfill a federal requirement applicable to the host. While we wish to encourage such projects as waste to energy projects, we also recognize the need to individually evaluate units which are integrated closely together at one facility.

3. Definition of Source Policy

This policy addresses two types of facilities: a CHP serving one thermal host, and a CHP serving in district energy for multiple customers. This policy is meant to provide a very simple rubric for sources and permitting authorities to follow in determining source boundaries. It is also meant to provide flexibility to CHP owners.

1. CHP serving thermal host

In this scenario, a CHP facility consistent with the applicability criteria above locates at,

adjacent, or contiguous to an industrial facility (the "host" facility) which is a major source. The CHP is designed and built to supply thermal and possibly electric energy to the host, and possibly also to supply electricity to the grid.

The definition of "building, structure, facility, or installation" provides three tests: (1) Is the CHP adjacent or contiguous to the host? (2) Is the CHP under common control with the host? – and (3) is the CHP either (a) part of the same standard industrial classification (SIC) code as the host, or if not, (b) is the CHP a support facility for the host? If the answer to all three tests were "yes", then we would consider the CHP a single source together with the host. If the answer to any of the three tests were "no", then we would consider the CHP to be a separate source from the host.

Today's memorandum clarifies that a CHP facility which is capable of providing power or steam/heat not only to the host, but also to the grid or elsewhere, may be considered a separate source from the host for purposes of NSR and Title V permitting. That is, permitting authorities may consider a CHP facility to be a separate source from the host facility, even if the CHP facility continues to provide all or most of its output to the host facility. The feature that distinguishes CHP facilities from other support facilities is the fact that a CHP facility is independently capable of providing power to the grid or customers other than the host facility. (This guidance applies even where the CHP facility is not necessarily currently providing power or steam/heat to other customers; it need only possess the technical capability to do so. By "technical capability", we mean that all necessary infrastructure would be in place and that steam or waste heat could be provided "at the turn of a valve.") Therefore if emissions from the CHP facility itself exceed the major stationary source threshold, then, as with any new major stationary source, the CHP facility must go through the PSD or nonattainment NSR permitting process (whichever is appropriate).

In addition, if the CHP facility, as a separate source, purchases the boilers that previously provided steam to the host, and takes action on the boilers – i.e. either retires the boilers or takes restrictive permit limits to restrict operation of those boilers – then the CHP facility may avail itself of netting credits from the boiler emissions that have been foregone. (Of course, these actions would have to be made enforceable as a practical matter in the CHP facility's permit). Those credits would no longer belong to the host. We believe that only by purchasing and taking action on the boilers will the CHP facility have assumed sufficient control that it may reasonably collect netting credits from the foregone boiler emissions. (PSD regulations require that creditable emissions decreases for netting purposes must be from emissions units within the same source, not from emissions units at other sources.) In this way, any possible violation of a boiler's emission limit could then be addressed through the CHP facility's permit. (Presumably the host facility would also be required to revise its permits to reflect the elimination of the boiler emission units.)

If, on the other hand, the host were to retain ownership of the boilers, then the CHP facility would not be permitted to collect netting credits from the boilers, because the CHP facility would not have taken any action that indicated that it had control over the boilers. Any potential netting credits generated from reduced use of the boilers could then only belong to the host. Why is this provision needed? It is needed because if the CHP facility and the boilers are permitted separately, then we cannot ensure that the host's boilers would continue to maintain the operating restrictions which had generated netting credits for the CHP facility.

2. District energy

A CHP facility that is connected to more than one customer facility or building via a steam supply system is called a district energy facility. The customer facilities may be nearby (adjacent) though not necessarily contiguous with a district energy facility. (The distance between a CHP facility and a customer is necessarily limited by how far steam can be efficiently transported via pipe, which is about 3 miles.) Some examples of district energy facilities are ones that support (a) multiple buildings in a municipal downtown area, (b) multiple buildings at a university campus, (c) more than one company's manufacturing or other industrial operations, and (d) an office park or industrial park, when the CHP facility is built to support the operations at the park and customers are then leased property within the park. In other words, district energy facilities can supply steam to more than one customer or to multiple buildings owned by a single customer.

District energy facilities may also fall into one of two main categories: either the district energy facility serves its customers' facilities by supplying them with 100 percent of the CHP facility's heating/cooling and electricity output (which is likely 100 percent of the customers' needs), or the district energy facility serves it customers by supplying 100 percent of their heating/cooling output to them, but some or all of its electric power production goes to the power grid.

The following diagram illustrates district energy:

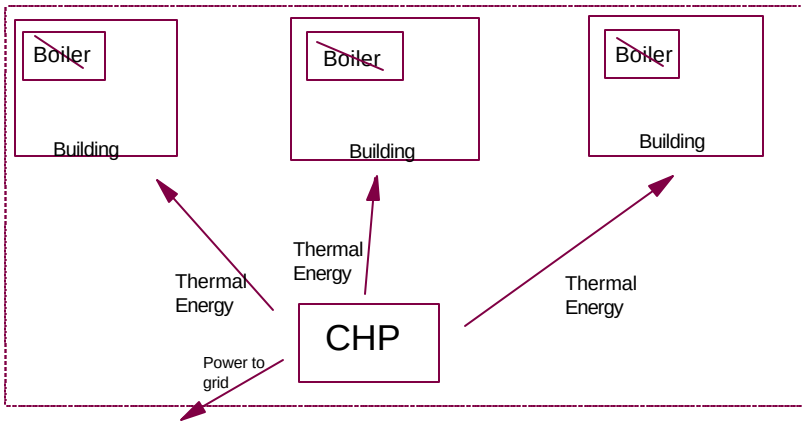
Today's memorandum establishes that a permitting authority may determine that a CHP constructed in district energy as described above is considered a separate source from all of its customers, provided that the CHP meets the criteria established in section V.2. above. In addition, a CHP in district energy may avail itself of netting credits generated from curtailing or shutting down the operation of its customers' previously-existing boilers, so long as the CHP purchases those boilers, and acts to curtail or shut down their operation.

4. Eligible CHP Systems

This guidance is applicable to technologies used to generate thermal energy and power sequentially from the same fuel combustion source. Below is a limited list of examples of technologies commonly used in CHP applications:

Boilers with Back Pressure Steam Turbines - In the traditional CHP configuration, a boiler generates steam which enters a steam turbine. The generator connected to the turbine shaft is used to generate electricity, and the lower pressure steam discharge from the turbine is used to satisfy thermal requirements.

Boilers with Extraction Steam Turbines - If higher pressure steam is required or in a retrofit situation if the original turbine design dictates, steam can be extracted through ports in the turbine prior to full expansion of the steam.



Gas Turbine with Heat Recovery -a gas turbine is used to turn a generator and produce electricity. A heat recovery steam generator recovers the waste heat from the turbine to produce steam/hot water/heating/cooling.

Gas Turbine Combined Cycle with Steam Recovery - A combined cycle system uses a gas turbine and heat recovery steam generator (HRSG). The steam generated by the heat recovery steam generator is subsequently used to turn a steam turbine-generator. The steam exhausted from the steam turbine is recovered for thermal end-use. Note that a combined cycle plant producing only electric power is not considered a CHP and does not achieve the higher efficiency of a combined cycle plant in CHP mode.

Reciprocating Engines with Heat Recovery - A reciprocating engine (mostly natural gas) drives a generator. The hot exhaust gases from the engine are directed to a heat recovery boiler to generate steam or hot water for thermal energy end-uses.

Fuel Cells with Heat Recovery - The fuel cell produces electricity and the byproduct hot water from the fuel cell is used; the heat from the fuel cell is recovered and used for hot water/heating.

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